CHAPTER 1

Introduction to Palpation

Overview

This chapter is an introduction to the general principles of palpation. The two major objectives of palpation, location and assessment of the target structure, are discussed first. General principles that explain how to palpate are then presented. The importance of palpating not only during a client examination but also during treatment is emphasized. The chapter concludes with an exercise that can help develop palpation skills and a recommendation to incorporate the practice of palpatory skills whenever our hands are on a client.

Note: The introductory palpation information covered in this chapter is sufficient to allow the reader to successfully palpate the bones and bony landmarks of the skeleton presented in Chapters 8 to 10. Palpating skeletal landmarks is relatively easy because they are hard tissue surrounded by the many soft tissues of the body; therefore their many features, such as tubercles, shafts, fossas, and condyles, stand out amongst the surrounding tissues. However, muscle palpation can be more nuanced and challenging. For this reason, it is strongly recommended that Chapter 2, The Art and Science of Muscle Palpation, is read before attempting the muscle palpations covered in Chapters 11 to 21. Chapter 2 explores palpation in much greater depth and offers more subtle and sophisticated methods and guidelines that are directly applicable to muscle palpation.

Chapter Outline

Chapter Objectives

After completing this chapter, the student/therapist should be able to perform the following:

1. Define the key terms of this chapter.
2. Discuss how palpation with mindful touch incorporates both the therapist's hands and mind.
3. State and discuss the importance of the two major objectives of palpation.
4. Describe the importance of moving slowly when palpating.
5. Discuss the importance of using appropriate pressure when palpating.
6. Discuss the importance of tissue barrier and how it relates to palpation.
7. Discuss the importance of the quality of palpation.
8. Discuss the importance of palpating not only during the examination of the client, but also when treating the client.
9. Describe one exercise that can be used to improve palpatory skills.
10. Explain the importance of constantly practicing palpation skills.

Key Terms

Appropriate pressure
Mindful intent
Mindful touch
Palpation
Palpatory literacy
Target muscle
Target structure
Tissue barrier

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WHAT IS PALPATION?

Palpation may be defined in many ways. The word *palpation* itself derives from the Latin palpatio, meaning "to touch." However, defining palpation as simply touching is too simplistic, because there is more involved. Inherent in the term palpation is not just touching, but also the act of sensing or perceiving what is being touched. In this sense, palpation involves more than just the fingers and hands. Palpation also involves the mind. Successful palpation requires us to feel with our minds as well as our fingers. When palpating, the therapist should be focused with a **mindful intent;** in other words, the therapist must be in his/her hands. All of the therapist's correlated knowledge of anatomy must be integrated into the sensations that the therapist's fingers are picking up from the client's body and sending to the brain. The therapist's mind must be open to the sensations that are coming in from the client, yet at the same time interpret these sensations with an informed mind (Figure 1-1). Incorporating mindful intent into examination and treatment sessions creates **mindful touch.**

BOX 1-1

A therapist may touch and palpate the client with more than just the fingers or hands. Sometimes the forearm, elbow, or even the feet are employed to contact the client. As a rule, this text refers to fingers or hands when referring to the therapist's contact upon the client.

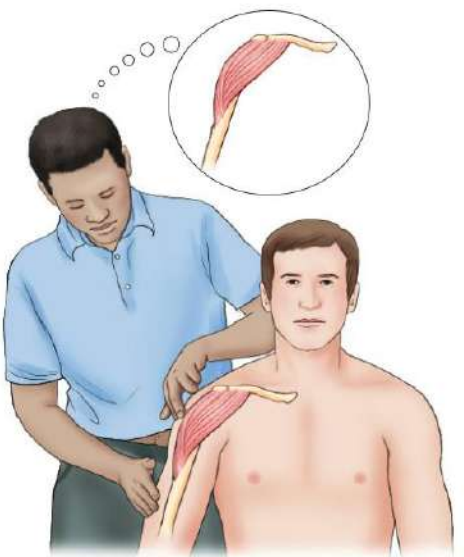

Figure 1-1 Palpation is as much an act of the mind as it is of the palpating fingers. Sensory stimuli entering through the therapist's hands must be correlated with a knowledge base of anatomy.

OBJECTIVES OF PALPATION: LOCATION AND ASSESSMENT

There are two main objectives when palpating. Step one is locating the target structure. Step two is assessing the target structure.

BOX 1-2

The term **target structure** is often used to name the particular structure of the body that the therapist is targeting to palpate. If the target structure is a muscle or muscle group, it is often called the **target muscle.**

The first objective, and indeed perhaps the major objective of the novice manual therapist, is to locate the target structure being palpated. This is no easy feat to achieve. It is one thing to simply touch the tissues of the client. It is an entirely different matter to be able to touch the tissues and discern the target structure from all the adjacent tissues. This requires the therapist to be able to locate all borders of the structure, superiorly, inferiorly, medially, laterally, and even superficially and deep. If the structure is immediately superficial to the skin, this may not be very difficult. Indeed, the olecranon process of the ulna or a well-developed deltoid muscle may be visually obvious and located without even touching the client's body. However, if the target structure is deeper in the client's body, locating the structure may present a great challenge.

BOX 1-3

As a rule, it is always best to first visually inspect the region that is to be palpated before placing your hands on the client. Once palpating hands are placed on the client, they block any visual information that might be present. See Chapter 2, The Art and Science of Muscle Palpation, for more on this idea.

As basic as palpation for the purpose of determining location seems, it is a supremely important first step, because it follows that if a structure cannot be accurately located, it cannot be accurately assessed. Once the target structure is located, then the process of assessment can begin. Assessment requires interpretation of the sensations that the palpating fingers pick up from the target structure. It involves becoming aware of the qualities of the target structure; its size, shape, and other characteristics. Is it soft? Is it swollen? Is it tense or hard? All of these factors must be considered when assessing the health of the target structure.

It is worthy of note that as high-tech diagnostic and assessment equipment continues to be developed in Western medicine, palpating hands remain the primary assessment tool of

a manual therapist. Indeed, for a manual therapist, palpation, the act of gathering information through touch, lies at the very heart of assessment. Armed with both an accurate location and an accurate assessment of the health of the target structure through careful palpation, the manual therapist can develop an effective treatment plan that can be confidently carried out.

BOX 1-4

As crucial as palpation is to assessment, it is still only one piece of a successful assessment picture. Visual observation, history, findings from specific orthopedic assessment procedures, and the client's response to treatment approaches must also be considered when developing an accurate client assessment.

HOW TO PALPATE

Move Slowly

Given that palpation is a cooperative effort between the hands and the mind, it is important that the therapist's mind has sufficient time to interpret and make sense of the sensory stimuli that are coming in through the palpating fingers. This requires that palpation is performed slowly. Moving too quickly or frenetically jumping around the client's body does not allow for effective and mindful palpation.

Use Appropriate Pressure

The next question that arises when exploring how to palpate is how much pressure do we use? In other words, what is **appropriate pressure**? Because palpation is an exercise in sensation, it is imperative that the therapist's fingers are sensitive to the client's tissues that underlie them. However, quantifying palpation pressure is difficult. Recommendations for the degree of palpation pressure vary from 5 grams to 4 kilograms of pressure; there is an 800-fold difference between these two figures! One method recommended to gauge light pressure is to press on your eyelids; whatever pressure is comfortable there would then be considered appropriate pressure when palpating lightly. How much pressure is too much when palpating with deep pressure? A good measure of this is to look for blanching of the fingernails of the palpating fingers. If they are blanched, sensitivity is most likely lost.

BOX 1-5

An exercise to see how ineffective too much pressure can be is to press the pad of your thumb forcefully against a hard surface for 5 to 10 seconds. Directly afterward, try to palpate something on a client's body and note how much sensitivity is lost.

Generally, most new therapists use too little pressure, probably because they are afraid of hurting the client. Being unfamiliar with exactly what structures are under the client's skin and where they are located, the therapist fears damaging tissue and hurting the client. An analogy can be made to entering a dark room. Because we cannot see the objects in the room, we fear to enter and explore. However, if we can turn on the light and illuminate the room, we find it easy to move through it with ease. Learning anatomy well is like turning on the light. A stronger knowledge base of the underlying anatomy, along with more hands-on experience, allows for our fear to recede and be replaced with clarity and confidence.

Conversely, there are those therapists who are heavy handed, using too much pressure and being oblivious to the comfort of the client. If a client tightens the target musculature because your palpation pressure is causing pain, then an accurate assessment of the tone of the muscle is not possible. This pressure would be considered to be too much.

BOX 1-6

There are techniques that comfortably enable the use of more palpatory pressure with a client. Generally, if you enter the client's tissues slowly while asking the client to breathe using deep and steady breaths, it is usually possible for the client to remain comfortable while you palpate more deeply. Techniques and guidelines such as these are discussed in more detail in Chapter 2, The Art and Science of Muscle Palpation.

The optimal pressure to use is whatever pressure is appropriate to the circumstance. Some clients are not comfortable with strong pressure because it hurts them; others prefer it. Some clients are not comfortable with very light pressure, because it tickles their skin and/or it feels like a tease because the subcutaneous tissues are not being engaged; others prefer light pressure. The same client may even prefer light pressure in one region of the body, but deeper pressure in another.

Although the health and comfort of the client must be kept foremost in mind, the therapist should remember that the primary purpose of palpation is to locate and assess the structures of the client's body. When pressing into the client's tissues, palpating fingers usually sink in until a **tissue barrier** is felt. A tissue barrier is felt when the client's tissues offer an increased resistance to the pressure of the therapist's fingers. The tissue that is providing the barrier is often the tissue that is important to locate and assess. It is important to not blindly push past this tissue barrier, but rather to match the resistance of this tissue and explore it more fully. Therefore appropriate pressure employed to palpate a client's tissues is usually whatever pressure is necessary to reach and explore the tissue that is providing the tissue barrier.

If a structure is located three layers down, then it may be impossible to palpate it unless deeper pressure is employed. For example, accessing the psoas major muscle within the abdominopelvic cavity requires a good amount of pressure.

This does not mean that the therapist should be rough, but if enough pressure is not used, the muscle cannot be reached and therefore cannot be palpated, located, and assessed. When we are working clinically, if we do not accurately assess the health of a client's structure because it requires deeper pressure that might temporarily be slightly uncomfortable for the client, then we will never be able to assess the client's condition; without an accurate assessment, we cannot treat the client to help them improve and feel better. Having said that, when lighter pressure can be used, it should. For example, if the medial or lateral epicondyle of the humerus is being palpated, there is simply no reason to press with anything more than light pressure, because these structures are located superficially (Figure 1-2). The same may be said for a thin superficial muscle of the body.

Quality of Palpation Touch

There is another aspect of palpation that must be addressed, which is the quality of the palpation touch. The quality of the palpation touch should be comfortable to the client. Generally, palpation is best achieved by the therapist using their fingers. When palpating with fingers, finger pads should ideally be used, not fingertips. Fingertip palpation tends to feel to the client as though he or she is being poked, not palpated. From the point of view of the therapist, finger pad palpation is also more desirable, because the pads of the fingers are much more sensitive than the fingertips and better able to pick up subtle palpatory clues in the client's body.

WHEN DO WE PALPATE?

Always. Whenever we are contacting the client, we should be palpating. This is true not only during the assessment phase of the session, but also during the treatment phase. Too many therapists view palpation and treatment as separate entities that are compartmentalized within a session. A therapist often spends the first part of the session palpating and gathering sensory input for the sake of assessment and evaluation. Using the information gathered during this palpation assessment stage, a treatment plan is determined and the therapist then spends the rest of the session implementing the treatment plan by outputting pressure into the client's tissues. Rigidly seen in this manner, palpation and treatment might each be viewed as a one-way street: palpation is sensory information in from the client, and treatment is motor pressure out to the client. The problem with this view is that we can also glean valuable assessment information while we are treating.

Treatment should be a two-way street that involves not just motor pressure out to the tissues of the client, but also continued sensory information in from the tissues of the client's body (Figure 1-3). While we are exerting pressure on the client's tissue, we are also sensing the quality of the tissue and its

Figure 1-3 This figure illustrates the idea that palpation should be done whenever the therapist contacts the client, even when administering treatment strokes.

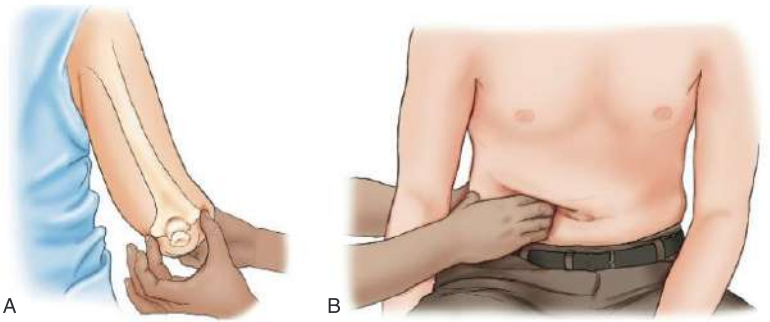

Figure 1-2 This figure illustrates the idea of using pressure that is appropriate to the structure being palpated. When the medial and lateral epicondyles of the humerus are being palpated, only light pressure is needed (A). However, when the psoas major muscle is palpated, deeper pressure is required (B).

response to our pressure. This new information might guide us to alter or fine-tune our treatment for the client. Thus while we work, we continue to assess, gathering information that guides the pace, depth, or direction of the next strokes. Ideally, no stroke should be carried out in a cookbook manner, performed as if on autopilot. Treatment is a dynamic process. How the middle and end of each stroke are performed should be determined from the response of the client's tissues to that stroke as we perform it. This is the essence of mindful touch, having a fluid interplay between assessment and treatment; assessment informs treatment and treatment informs assessment, creating optimal therapeutic care for the client.

HOW TO LEARN PALPATION

A long-standing exercise to learn palpation is to take a hair and place it under a page of a textbook without seeing where you placed it. With your eyes closed, palpate for the hair until you find it and can trace its shape under the page. Once found, now replace the hair, this time under two pages, and palpate to locate and trace it. Continue to increase the number of pages placed over the hair until you cannot find it. If this exercise is repeated, the number of pages under which you can locate and trace the hair will gradually increase, and your sensitivity will improve.

Even more important than performing palpation exercises with textbooks, it is imperative that palpation is applied directly to the client. When your hands are on your fellow students in school, or on your clients or patients if you are in professional practice, constantly try to feel for the structures about which you have learned in your anatomy, physiology, and kinesiology classes. As your hands are moving on the client's skin, close your eyes so that you block out extraneous sensory stimuli, and try to picture all the subcutaneous structures over which your hands are passing. The better you can picture an underlying structure, the better you will be able to feel it with your palpating hands and your mind. Once felt, you can focus on locating its precise location and assessing its tissue quality.

Given that the foundation of all manual skills rests upon our palpatory ability to read the clues and signs that a client's body offers, the better we hone this skill, the greater **palpatory literacy** we gain. Perfecting our palpatory literacy is a work in progress, an endless journey. The greater we polish and perfect this skill, the greater our therapeutic potential becomes, bringing greater benefit to our clients. However, written chapters can only provide guidelines and a framework for how to palpate. Ultimately, palpation is a kinesthetic skill, and as such can only be learned by kinesthetic means. In other words, "palpation cannot be learned by reading or listening; it can only be learned by palpation."[1]

Review Questions

1. What is meant by the term *palpation?*
2. What does the concept of *mindful intent* involve?
3. What is the term used to describe incorporating mindful intent into the processes of examination and treatment?
4. List the two main objectives during palpation.
5. What problem will arise due to the lack of ability to accurately locate the target structure?
6. What is the importance of the therapist's speed in regard to palpation?
7. Issues of therapist experience and client comfort aside, what best describes an appropriate amount of pressure?
8. What is meant by the term *tissue barrier?*
9. What part of the fingers should be used for palpating? Why?
10. When, during a session, should a therapist palpate the client's body tissues?
11. How may a therapist increase their palpatory literacy?

Deeper Thoughts

In addition to the example of palpating a hair under layers of textbook pages, in what other ways can a therapist try to increase their sensitivity?

REFERENCE

1. Frymann VM: Palpation, its study in the workshop, *AAO Yearbook:* 16–31, 1963.

CHAPTER 2

The Art and Science of Muscle Palpation

Overview

This chapter expands on the principles of palpation covered in Chapter 1, specifically discussing palpation as it applies to the skeletal muscles of the body. Twenty guidelines are discussed that comprise the art and science of muscle palpation. The two most basic guidelines, described as the *science of muscle palpation*, are knowing the attachments and actions of the target muscle. The additional 18 guidelines describe how to begin and perfect the *art of muscle palpation*. In all, these guidelines can help increase palpatory literacy of the muscles of the body.

Chapter Outline

Introduction
List of Muscle Palpation Guidelines
The Science of Muscle Palpation
Beginning the Art of Muscle Palpation
Perfecting the Art of Muscle Palpation
Conclusion

Chapter Objectives

After completing this chapter, the student/therapist should be able to perform the following:

1. Define the key terms of this chapter.
2. Explain why and demonstrate how knowing the attachments of a muscle is useful for its palpation.
3. Explain why and demonstrate how knowing the actions of a muscle is useful for its palpation.
4. Discuss and give an example of the importance of choosing the best action of a target muscle to isolate its contraction.
5. Discuss and give an example of the idea of using critical reasoning to figure out how to palpate a muscle instead of memorizing its palpation procedure.
6. Discuss the value of and be able to demonstrate how to add resistance to the client's contraction of the target muscle.
7. Explain and give an example of why another joint should not be crossed when adding resistance to the client's contraction of the target muscle.
8. Explain why it is best to look for a target muscle before placing the palpating hand on the client.
9. Explain why it is best to first locate a target muscle in the easiest place possible.
10. Discuss the value of and demonstrate strumming perpendicularly across the belly or tendon of a target muscle.
11. Explain the value of and be able to use baby steps when palpating a muscle.
12. Discuss the importance of alternately contracting and relaxing the target muscle.
13. Explain, give an example of, and demonstrate how knowledge of coupled actions can help palpation of scapular rotator muscles.
14. Explain, give an example of, and demonstrate how to use neural (reciprocal) inhibition to palpate a target muscle.
15. Explain the importance of using appropriate pressure, and give examples of when using light pressure is preferable and when using deep pressure is preferable.
16. Discuss the importance of slow palpation and the client's breathing pattern when palpating deeper muscles.
17. Explain and give an example of using one muscle as a landmark to locate and palpate another muscle.
18. Discuss why it is important to relax and passively slacken a target muscle when palpating its bony attachments.
19. Explain why it can be helpful for therapists to close their eyes when palpating.

20. Explain why it can be helpful for the therapist to construct a mental image of the client's anatomy under the skin.
21. Describe an approach that can be tried to lessen the sensitivity of a client who is ticklish.
22. Explain the importance of having short and smooth fingernails.
23. Discuss the relationship between using the optimal client position for target muscle palpation and treating the client.

Key Terms

Add resistance
Alternately contract and relax
Appropriate pressure
Art of muscle palpation
Baby steps
Coupled actions
Isolated contraction
Look before you touch
Neural inhibition
Optimal palpation position
Palpation hand
Reciprocal inhibition
Science of muscle palpation
Stabilization hand
Strumming perpendicularly
Target muscle
Target structure
Visual observation

INTRODUCTION

As described in Chapter 1, palpation of the client's body involves the location and assessment of a structure termed the **target structure**. The first step of palpation is to accurately locate the target structure. Once located, the second step is to assess its health. When the target structure is a bone or bony landmark, the process of palpation is relatively easy, because the skeleton is a hard tissue that is surrounded by soft tissues. Therefore bones and bony landmarks stand out. However, when the target structure is a muscle, palpation can be more difficult, because a muscle is a soft tissue that is usually surrounded by other soft tissues; this makes the discernment of one muscle from all the adjacent muscles and other soft tissues more challenging.

Given that massage therapists and many other manual therapists work primarily on myofascial tissues, accurate palpation of the musculature is of the utmost importance; this is especially true when working clinically. The emphasis of this chapter is to learn how to carry out the first step of muscle palpation; that is, to learn how to locate a **target muscle**. When we speak of palpating a muscle, as a rule we are referring to the location of the muscle. Toward this end, twenty guidelines are offered in this chapter that will help increase palpatory literacy of the musculature of the body. A list of these guidelines is given here; a detailed explanation of each of the guidelines follows. It is recommended that this chapter is read in its entirety before attempting the palpations of the skeletal muscles covered in Chapters 11 to 21.

LIST OF MUSCLE PALPATION GUIDELINES

Each of the following muscle palpation guidelines will be discussed in this chapter. All twenty are summarized in list form here.

1. Know the attachments of the target muscle so that you know where to place your hands.
2. Know the actions of the target muscle. The client will most likely be asked to perform one of them to contract the target muscle so that it can be discerned from the adjacent musculature. (Make sure that the client is not asked to hold the contraction too long or the target muscle may fatigue and the client may become uncomfortable.)
3. Think critically to choose exactly which joint action of the target muscle best isolates its contraction.
4. If necessary, add resistance to the client's contraction of the target muscle. (When resistance is added, do not cross any joints that do not need to be crossed; in other words, be sure to resist only the action of the target muscle that is desired.)
5. Look before placing your palpating hand on the client. (This is especially important with superficial muscles.)
6. First find and palpate the target muscle in the easiest place possible.
7. Strum perpendicularly across the belly or tendon of the target muscle.
8. Once located, follow the course of the target muscle in small successive baby steps.
9. At each baby step of palpation, have the client alternately contract and relax the target muscle, and feel for this tissue texture change as the muscle goes from relaxed and soft, to contracted and hard, to relaxed and soft again.
10. Use knowledge of coupled actions to palpate target muscles that are scapular rotators.
11. To aid palpation of the target muscle, use reciprocal inhibition of another muscle when needed. (When reciprocal inhibition is used, do not have the client contract the target muscle too forcefully, or the other muscle that is being reciprocally inhibited may be recruited anyway.)
12. Use appropriate pressure. Appropriate pressure is neither too heavy nor too light.
13. When using deep palpation pressure, sink slowly into the client's tissues as the client breathes slowly and evenly.
14. Once the palpation of one muscle is known, it can be used as a landmark to locate other muscles.
15. Relax and passively slacken the target muscle when palpating it at its bony attachment.
16. Close your eyes when you palpate to focus your attention on your palpating fingers.
17. Construct a mental picture of the client's anatomy under the skin as you palpate.
18. If the client is ticklish, use firm pressure and have the client place a hand over your palpating hand.
19. Fingernails need to be very short and smooth.

20. Place the client in a position that is optimal for the muscle palpation.

Refer to http://evolve.elsevier.com/Muscolino/palpation for a demonstration of how to palpate.

THE SCIENCE OF MUSCLE PALPATION

Guideline #1: Know the Attachments of the Target Muscle

When a target muscle is superficial, it is usually not difficult to palpate. If we know where it is located, we can simply place our hands there and feel for it. Unless there is a great deal of subcutaneous fat in that region of the body, apart from the client's skin and some thin fibrous fascial membranes, we will be directly on the muscle. Therefore the first step of muscle palpation is to know the attachments of the target muscle. For example, if we know that the deltoid attaches from the lateral clavicle, acromion process, and spine of the scapula, to the deltoid tuberosity of the humerus, then we need simply place our palpating hand there to feel it (Figure 2-1).

Guideline #2: Know the Actions of the Target Muscle

Often, even if a target muscle is superficial, it can be difficult to discern the borders of the muscle. If the target muscle is deep to another muscle, it can be that much harder to palpate and discern from superficial and other nearby muscles. To better discern the target muscle from all adjacent musculature and other soft tissues, it is helpful to ask the client to contract the target muscle by doing one or more of its actions. If the target muscle contracts, it will become palpably harder. Assuming that all the adjacent muscles stay relaxed and therefore palpably soft, the difference in tissue texture between the hard target muscle and the soft adjacent muscles will be clear. I like to refer to the contracted muscle as being "the only hard, soft tissue amidst a sea of soft, soft tissues." This will allow an accurate determination of the location of the target muscle. Therefore the second step of muscle palpation is to know the actions of the target muscle (Figure 2-2).

Guidelines #1 and #2 of muscle palpation involve knowing the "science" of the target muscle; in other words, knowing the attachments and actions of the muscle that were learned when the muscles of the body were first learned. Armed with this knowledge, the majority of muscle palpations can be reasoned out instead of memorized. Using the attachments and actions to palpate a target muscle can be thought of as the **science of muscle palpation**.

BEGINNING THE ART OF MUSCLE PALPATION

Guideline #3: Choose the Best Action of the Target Muscle to Make It Contract

Applying knowledge of the attachments and actions of a target muscle to palpate it is a solid foundation for palpatory literacy. However, effective palpation requires not only that the target muscle contracts, but that an **isolated contraction** of the target muscle occurs. This means that the target muscle needs to be the only muscle that contracts, and all muscles near the target muscle must remain relaxed. Unfortunately, because adjacent muscles often share the same joint action

Figure 2-1 The deltoid is a superficial muscle and can be palpated by simply placing our palpating hand on the muscle between its attachments.

Figure 2-2 The precise location of the deltoid is more easily palpated if the deltoid is contracted. In this figure, the client is asked to abduct the arm at the shoulder (glenohumeral) against the force of gravity.

with the target muscle, it is usually not enough to simply place our hands on the location of the target muscle and then choose any one of its actions to contract it. If the action chosen is shared with an adjacent muscle, then it will also contract, making it very difficult to discern the target muscle from the adjacent muscle.

For this reason, knowing which joint action to ask the client to perform is where the therapist needs to be creative and think critically. This is where the art of muscle palpation begins. It requires knowledge of not only of the actions of the target muscle, but also the actions of all adjacent muscles. With this knowledge, the client can be asked to perform the best joint action for the palpation of the target muscle. This joint action will usually be the one that is most different from the joint actions of adjacent muscles.

BOX 2-1

The goal when engaging the target muscle to contract is to have an isolated contraction of the target muscle. This means that the target muscle must be the only muscle that contracts and every other muscle must remain relaxed. Although this is the ideal, it is not always possible to achieve.

BOX 2-2

There are times when the client is not able to perform only the action that is asked for by the therapist; this is especially true with actions of the toes, because we do not usually develop the coordination necessary to isolate certain toe motions. For example, if the target muscle is the extensor digitorum longus (EDL) and the client is asked to engage this muscle by extending toes two through five at the metatarsophalangeal and interphalangeal joints, the client may be unable to extend these toes without also extending the big toe (toe one) at the same time. This poses a problem because extending the big toe will also engage the extensor hallucis longus (EHL) muscle. When this happens, it is tempting to isolate extension of toes two through five by holding down the big toe of the client so that it does not move into extension. However, the goal of engaging the target muscle is for it to be the only muscle that contracts. If the big toe is held down in this scenario, even though the big toe is not moving, the EHL muscle is still contracting; it is simply contracting isometrically instead of concentrically. This will still cause the EHL to contract and harden, making it harder to palpate and discern the EDL. For this reason, any time that a client contracts a muscle that he or she is not supposed to, preventing the client's body part from moving does not help the palpation. It is the *contraction* of any muscle other than the target muscle that is undesirable, not the movement of a client's body part.

For example, if the flexor carpi radialis (FCR) of the wrist flexor group is the target muscle, then asking the client to flex the hand at the wrist joint will engage not only the FCR, but also the other two wrist flexor group muscles, the palmaris longus (PL) and flexor carpi ulnaris (FCU). In this case, to palpate and discern the FCR from the adjacent PL and FCU, the client should be asked to do radial deviation of the hand at the wrist joint instead of flexion of the hand at the wrist joint. This will better isolate the contraction to the FCR. It becomes palpably harder than the relaxed and palpably softer PL and FCU muscles, which facilitates palpating and discerning the FCR (Figure 2-3).

PERFECTING THE ART OF MUSCLE PALPATION

Knowing the attachments and actions of the target muscle are the first two steps of learning the science of muscle palpation. Determining which joint action to ask the client to perform is the beginning of learning the **art of muscle palpation**. However, perfecting the art of muscle palpation

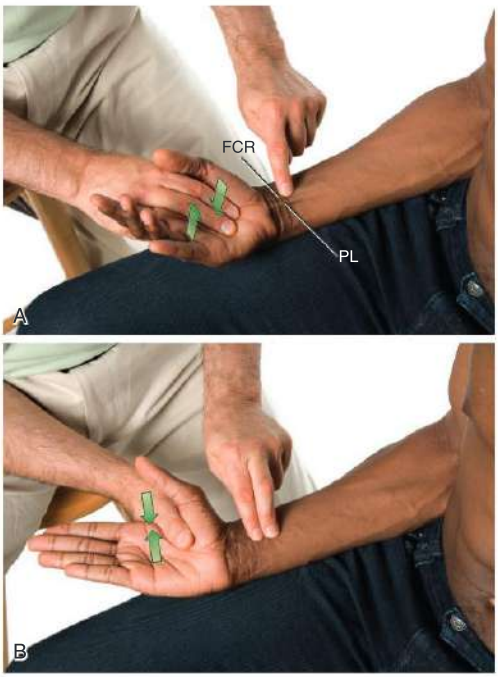

Figure 2-3 The flexor carpi radialis (FCR) muscle is being palpated. If the client is asked to flex the hand at the wrist joint as shown in **A**, the FCR will contract, but so will the adjacent palmaris longus (PL) muscle. However, if the client is asked to radially deviate the hand at the wrist joint as shown in **B**, the contraction is isolated to the FCR while the adjacent PL remains relaxed.

involves the knowledge and application of many more guidelines. These additional guidelines are presented in the following pages. A summary list of all twenty muscle palpation guidelines has already been given. It is difficult if not impossible to memorize a list this long; rather these guidelines need to be learned by using them as the palpations of the skeletal muscles of the body are covered in Chapters 11-21 of Part IV of this book. With practice, these guidelines will become familiar and comfortable to you and will enhance the art and science of your muscle palpation technique.

BOX 2-3

When palpating, the hand of the therapist that is doing the palpation is called the **palpation hand**. The other hand, in this case offering resistance, is called the stabilization hand.

Guideline #4: Add Resistance to the Contraction of the Target Muscle

When a client is asked to do one of the joint actions of the target muscle to make it contract, harden, and stand out, there are times when this contraction is not forceful enough to make it easily palpable. This is especially true if the joint action does not require a large body part to be moved and/or if the body part that is moved is not moved against gravity. When the client's contraction of the target muscle is not forceful enough, it might be necessary for the therapist to **add resistance** so that the target muscle contracts harder and stands out more. A good example is when the target muscle is the pronator teres and the client is asked to pronate the forearm at the radioulnar joints. Because the forearm is not a very large body part and pronation does not occur against gravity, the pronator teres muscle will contract, but most likely not forcefully enough to make it stand out and be easily palpable. In this case, the therapist can add resistance to the client's contraction by resisting the forearm during pronation. This requires a more forceful contraction of the pronator teres, making it easier to palpate and discern from the adjacent musculature (Figure 2-4).

Resisting a client's target muscle contraction is not a battle between the therapist and client to see who is stronger. The role of the therapist is simply to oppose the force of the client's muscle contraction, not overpower the client. The degree that the client is asked to contract the target muscle can vary. Ideally, it should be the lightest amount necessary to bring out the target muscle's contraction so that it is palpable. This is especially true if the target muscle is a small muscle that is deep to a larger muscle that has the same action, for example, the piriformis deep to the gluteus maximus. Both of these muscles are lateral rotators of the thigh at the hip joint. As a rule, a gentle lateral rotation contraction engages the smaller deeper piriformis without engaging the larger more superficial gluteus maximus. This allows us to discern the piriformis's contraction without the gluteus maximus contracting and blocking our palpation. Ideally, we want just enough contraction to feel the piriformis "pop," in other words, to feel its contraction, while the gluteus maximus remains relaxed and soft. However, there are also times when a more forceful contraction is needed to feel a target muscle's contraction. A good guideline is to begin with a gentle resistance as you try to palpate the target muscle. If it not successful, then gradually increase the force of the resistance as necessary.

Whenever resistance is added to the contraction of the target muscle by the client, it is extremely important that the therapist does not cross any additional joints with the placement of the stabilization hand. The goal of having a

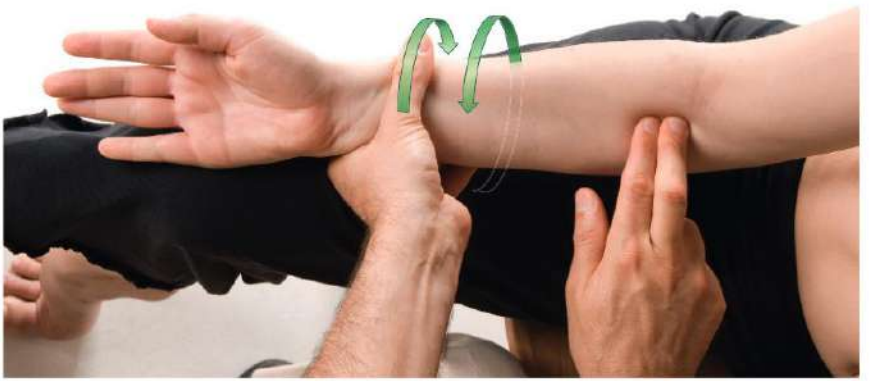

Figure 2-4 To create a more forceful contraction of the pronator teres muscle, the therapist can hold on to the client's distal forearm and resist forearm pronation at the radioulnar joints. Note that the stabilization hand resisting the client's forearm pronation is placed on the distal forearm and does not cross the wrist joint to hold the client's hand.

BOX 2-4

When you ask the client to contract the target muscle or to contract it against your resistance during palpation, remember to give the client a rest every few seconds or so. Holding a sustained isometric contraction can become uncomfortable and painful. It is more comfortable for the client and actually better for our palpation procedure if the client is asked to alternately contract and relax the target muscle instead of holding a sustained isometric contraction. (See Guideline #9 for more on alternately contracting and relaxing the target muscle.)

client contract the target muscle during palpation is to limit contraction to the target muscle. This way, it will be the only muscle that is palpably hard and can be discerned from the adjacent relaxed and palpably soft muscles. However, if the therapist's stabilization hand does cross other joints, it is likely that muscles crossing these joints will also contract. This defeats the purpose of having an isolated contraction of the target muscle.

For example, in the case of the pronator teres palpation, when resistance to forearm pronation is added, it is important that the therapist's stabilization hand does not cross the wrist joint and hold the client's hand. If the stabilization hand holds the client's hand, then other muscles that cross the client's wrist joint, such as the muscles of the wrist flexor group that move the hand at the wrist joint, or flexor muscles of the fingers, will likely also contract, making it difficult to discern the pronator teres from these adjacent muscles. Therefore the resistance hand should be placed on the client's forearm (see Figure 2-4). Ideally, placing the resistance hand on the distal end of the forearm affords the best leverage force so that the therapist does not have to work as hard.

Generally, if the therapist is resisting an action of the arm at the shoulder joint, the therapist's stabilization hand should be placed just proximal to the elbow joint and not cross the elbow joint to grasp the client's forearm. If the therapist is resisting an action of the forearm at the elbow joint, the therapist's stabilization hand should be placed on the distal forearm and not cross the wrist joint to grasp the client's hand. If the therapist is resisting an action of the hand at the wrist joint, the therapist's stabilization hand should be placed on the palm of the hand and not cross the metacarpophalangeal joints to grasp the client's fingers. The same reasoning can be applied to the lower extremity and the axial body.

One other aspect of adding resistance is the angle of the client's joint when the resistance is added. As a rule, it is better to first allow the client to slightly move the joint being crossed and then contact the client to add the resistance. For example, if the muscle being palpated is a wrist flexor muscle, make sure that the client's hand is first slightly flexed at the wrist joint and then add resistance to wrist flexion (Figure 2-5). This usually creates a better isolated contraction of the target muscle, because the direction that the client must move to press against your contact is better focused at the joint where resistance is being offered. Continuing with the wrist flexor musculature again as our example, if the client is asked to contract against our resistance with the hand in neutral position at the wrist joint, it is likely that their contraction will originate at the elbow joint instead of the wrist joint, because contraction of elbow joint flexors will also push against our resistance as seen in Figure 2-5, *A*. However, if the client's hand is first slightly flexed, then the angle of the client's force will less likely be generated from the elbow joint, because the line of force of elbow joint flexion

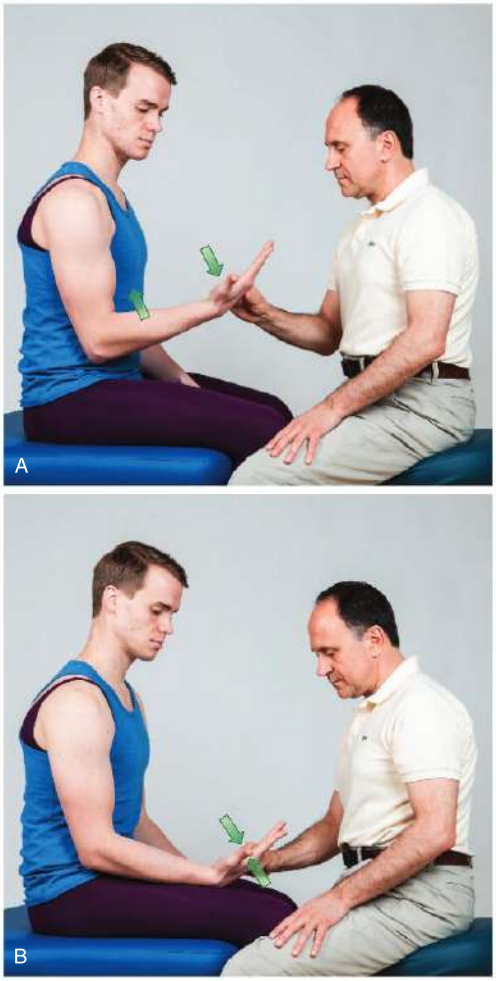

Figure 2-5 Optimizing the angle of the client's wrist joint when offering resistance to flexion is important. **A**, The wrist joint is in neutral position. **B**, The wrist joint is first slightly flexed.

is now different from the line of force of wrist joint flexion as seen in Figure 2-5, *B*.

Guideline #5: Look Before You Palpate

Even though palpation is done via touching, **visual observation** can be a valuable tool for locating a target muscle. This is especially true for muscles that are superficial and whose contours show through the skin. Very often, a target muscle visually screams, "Here I am!" yet the therapist doesn't see it because the palpating hand is in the way. This may be true when the target muscle is relaxed, but is even more likely to be true when the target muscle is contracted (especially if it contracts harder from increased resistance), because when it contracts and hardens, it often pops out visually. For this reason, whenever attempting to palpate a target muscle, look first; then place your palpating hand over the muscle to feel for it.

For example, when palpating the PL and FCR muscles of the wrist flexor group, before placing your palpating hand on the client's anterior forearm, first look for the distal tendons of these two muscles at the anterior distal forearm near the wrist joint. They may be fully visible, aiding you in finding and palpating them (Figure 2-6, *A*). If they are not visible, ask the client to flex the hand at the wrist joint, and add resistance if you would like. Now look again before placing your palpating hand on the client. When contracted, it is even more likely that these distal tendons will tense and visually pop out, helping you to locate and palpate them (see Figure 2-6, *B*). There are many muscles whose visual information can help with their palpation. For this reason, it is a good rule to always **look before you touch**.

BOX 2-5

It should be noted that the palmaris longus (PL) muscle is often missing, either unilaterally or bilaterally, in many individuals.

Guideline #6: First Find the Target Muscle in the Easiest Place Possible

Once a target muscle has been found, it is much easier to continue to palpate along its course than it is to locate it in the first place. For this reason, a good palpation guideline is to always feel for the target muscle wherever it is easiest to first find. Once located, then you can continue to palpate it toward

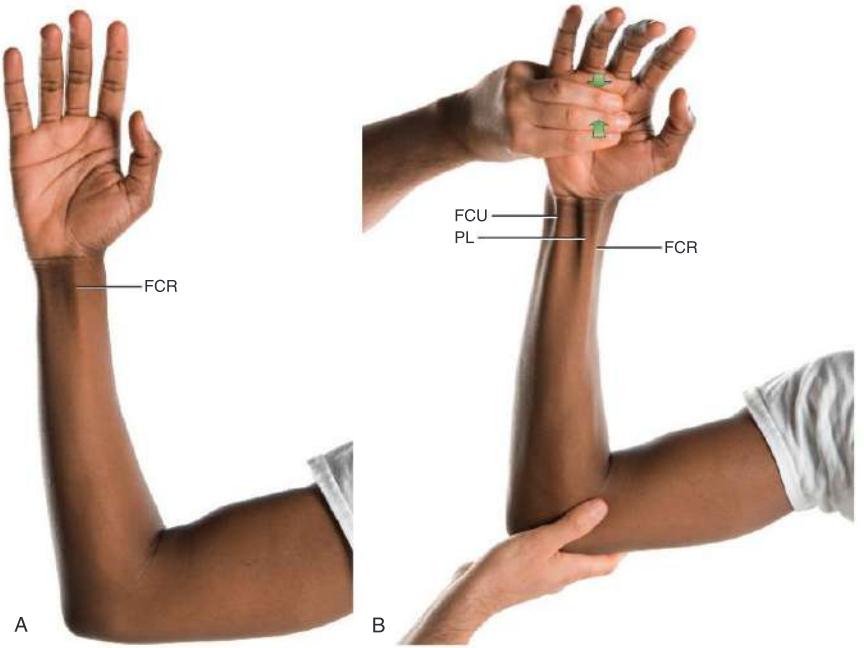

Figure 2-6 **A** shows that the distal tendon of the flexor carpi radialis (FCR) muscle might be visible even when it is relaxed. **B** shows that when contracted (in this case, against resistance), its distal tendon tenses and becomes even more visually apparent. Note: The palmaris longus (PL) and flexor carpi ulnaris (FCU) tendons are also visible.